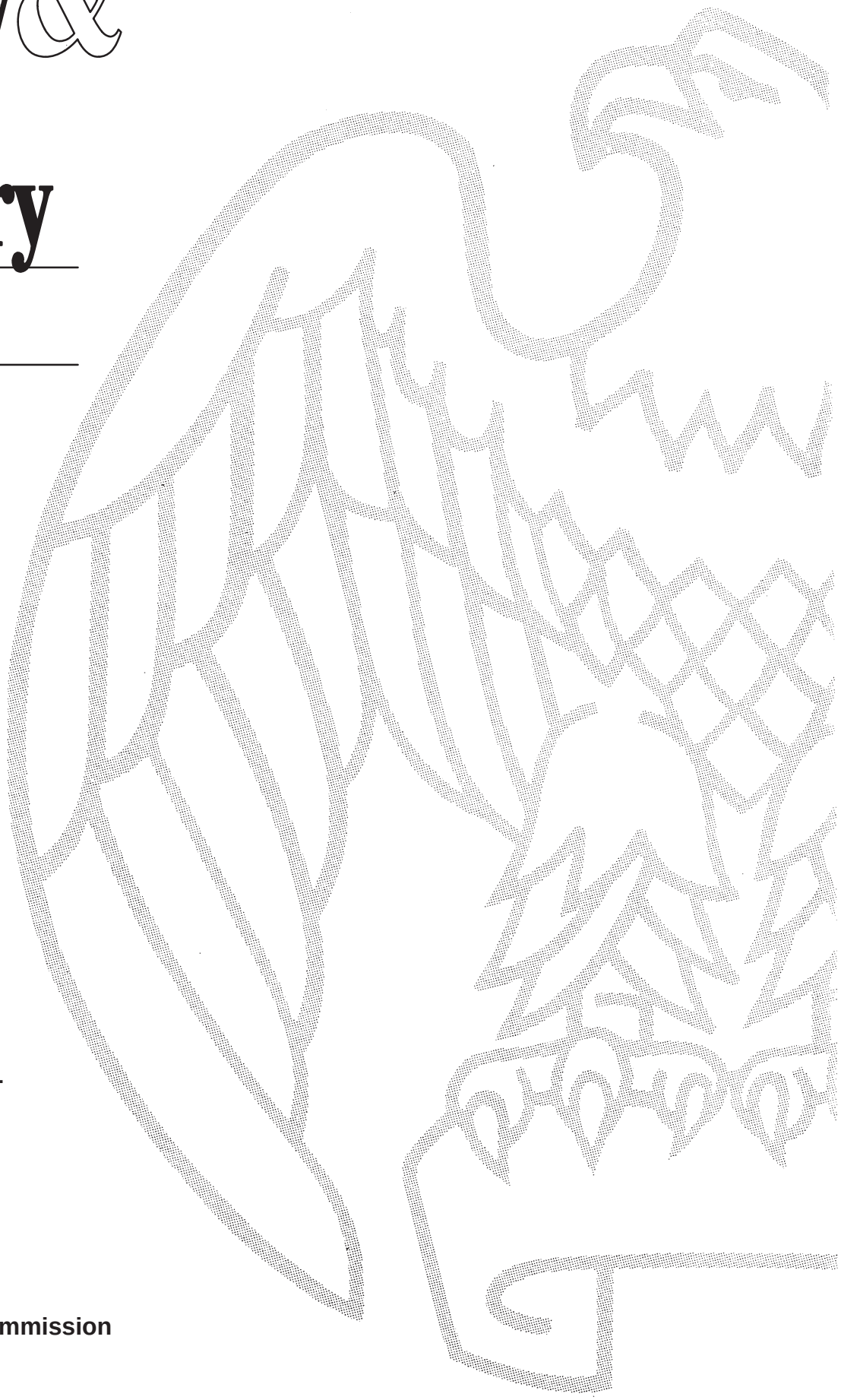
Industry & Trade Summary

Synthetic Organic Pigments



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PREFACE

In 1991 the United States International Trade Commission initiated its current *Industry and Trade Summary* series of informational reports on the thousands of products imported into and exported from the United States. Each summary addresses a different commodity/industry area and contains information on product uses, U.S. and foreign producers, and customs treatment. Also included is an analysis of the basic factors affecting trends in consumption, production, and trade of the commodity, as well as those bearing on the competitiveness of U.S. industries in domestic and foreign markets.[1]

This report on synthetic organic pigments covers the period 1991 through 1995 and represents one of approximately 250 to 300 individual reports to be produced in this series. Listed below are the individual summary reports published to date on the energy, chemicals, and textiles sectors.

USITC publication number	*Publication date*	*Title*
Energy and Chemicals:		
2458	November 1991	Soaps, Detergents, and Surface-Active Agents
2509	May 1992	Inorganic Acids
2548	August 1992	Paints, Inks, and Related Items
2578	November 1992	Crude Petroleum
2588	December 1992	Major Primary Olefins
2590	February 1993	Polyethylene Resins in Primary Forms
2598	March 1993	Perfumes, Cosmetics, and Toiletries
2736	February 1994	Antibiotics
2739	February 1994	Pneumatic Tires and Tubes
2741	February 1994	Natural Rubber
2743	February 1994	Saturated Polyesters in Primary Forms
2747	March 1994	Fatty Chemicals
2750	March 1994	Pesticide Products and Formulations
2823	October 1994	Primary Aromatics
2826	November 1994	Polypropylene Resins in Primary Forms
2845	March 1995	Polyvinyl Chloride Resins in Primary Forms
2846	December 1994	Medicinal Chemicals, except Antibiotics
2866	March 1995	Hose, Belting, and Plastic Pipe
2943	December 1995	Uranium and Nuclear Fuel
2945	January 1996	Coal, Coke, and Related Chemical Products
3014	February 1997	Synthetic Rubber
3021	February 1997	Synthetic Organic Pigments
Textiles and apparel:		
2543	August 1992	Nonwoven Fabrics
2580	December 1992	Gloves
2642	June 1993	Yarn
2695	November 1993	Carpets and Rugs
2702	November 1993	Fur Goods

[1] The information and analysis provided in this report are for the purpose of this report only. Nothing in this report should be construed to indicate how the Commission would find in an investigation conducted under statutory authority covering the same or similar subject matter.

PREFACE—*Continued*

USITC publication number	*Publication date*	*Title*
Textiles and apparel—*Continued*:		
2703	November 1993	Coated Fabrics
2735	February 1994	Knit Fabric
2841	December 1994	Cordage
2853	January 1995	Apparel

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CONTENTS—*Continued*

ABSTRACT

This report addresses industry and trade conditions in the synthetic organic pigments industry for the period 1991-95.

- The U.S. synthetic organic pigments industry consists principally of large, foreign-owned, multinational chemical companies and smaller, independent, U.S.-owned companies. The large multinational companies appear to be competitive, with respect to price and quality, in the U.S. market as well as other markets around the world. The independent U.S. organic pigment manufacturers focus on the U.S. market and are competitive in selective submarkets. Industry officials state that, in the 1990s, the organic pigments industry, both in the United States and in most developed countries, has been and will continue to be challenged by increased environmental regulations, unreliable sources of chemical intermediates, and the presence of low-priced products from India and China.

- In the United States and most developed countries, this industry is a relatively small specialty segment of the larger chemical industry. The major consuming industries of organic pigments are printing inks, coatings, and plastics, which in turn are influenced by conditions in the economy. Over the years, there have been literally hundreds of organic pigments manufactured, with each having specific physical characteristics that determine its end use. This diversity of products has created a number of submarkets within each consuming industry.

- U.S. aggregate production of synthetic organic pigments increased by 38 percent during 1991-95, from $837 million to an estimated $1.2 billion, while the value of apparent U.S. consumption increased by 39 percent over the same period. Imports accounted for approximately 25 percent of consumption in terms of value, but increased from approximately 32 percent to an estimated 38 percent in terms of quantity. The principal synthetic organic pigment suppliers to the United States during the period were Germany, Japan, Switzerland, and the United Kingdom. These countries were major suppliers of high- and medium-performance synthetic organic pigments. In 1996, the rates of duty for organic pigments ranged from free to 17.3 percent. Since the end of the Tokyo Round of the General Agreement on Tariffs and Trade (GATT) in 1979, import duties for pigments have declined steadily. Tariff reductions agreed to during the recent Uruguay Round of trade negotiations continued this trend.

- The total value of U.S. exports increased 42 percent from some $200 million in 1991 to $283 million in 1995, but in terms of quantity, exports increased by 59 percent from 22,000 kilograms to 35,000 kilograms. Among major U.S. trading partners, exports increased most significantly to Canada, the United Kingdom, and Belgium. Among developing countries, exports increased most significantly to Mexico and Brazil. Export levels were influenced, in part, by foreign business conditions and the relative competitive strength of multinational firms.

INTRODUCTION

This summary covers synthetic organic pigments,[1] which are chemical compounds used to impart color to products found in end-use markets such as inks, paints, and plastics. The period covered is 1991-95.[2] In the United States and in other industrialized countries, the organic pigments industry is a relatively small part of each country's domestic chemical industry.[3] The world organic pigments industry is regarded as a mature industry,[4] strongly influenced by large European Union (EU)-owned and Japanese-owned companies.[5] However, a number of smaller, independent, U.S.-owned companies play a significant role in the domestic market. The U.S. imports-to-consumption ratio during 1991-95 was about 25 percent by value, but in terms of quantity it increased from 32 percent to 38 percent.[6] In the 1990s, the organic pigments industries in industrialized countries were confronted with (a) the need to comply with stricter environmental regulations, (b) uncertain availability of many intermediate chemicals used in pigment production, and (c) increased competition from new pigment suppliers in developing countries.

This summary of industry and trade information on synthetic organic pigments is organized into four sections: U.S. industry profile, U.S. market, U.S. trade, and foreign industry profile. The U.S. industry section discusses the types of organic pigments and also describes the industry structure, costs, pricing, distribution, and restructuring. The U.S. market section provides information on U.S. apparent consumption, production, and end-market environment. The section on U.S. trade includes information on the U.S. tariff structure as well as the tariff structures of major U.S. export markets. The foreign industry profile section examines the major world organic pigments producers and markets.

Classification

The Color Pigments Manufacturers Association (CPMA) has defined pigments as:

> Colored, black, white, or fluorescent particulate organic or inorganic solids which usually are insoluble in, and essentially physically and chemically unaffected by, the vehicle or substrate in which they are incorporated. They alter appearance by selective absorption and/or by scattering of light. Pigments are usually dispersed in vehicles or substrates for application, as for instance in the manufacture of inks, plastics, or other polymeric materials. Pigments retain a crystal or particulate structure throughout the coloration process.[7]

The first step in classifying pigments is to distinguish organic from inorganic pigments. Inorganic pigments consist of compounds containing metal elements such as cadmium and chromium, while synthetic organic pigments consist of large complex chemical structures, which are produced from simpler organic compounds such as benzene, aniline, and naphthalene. Organic pigments are usually brighter, purer, and richer in color than their inorganic counterparts. However, organic pigments are generally less opaque and less resistant to sunlight, extreme heat, and chemical deterioration. Furthermore, organic pigments are often significantly more expensive than their inorganic counterparts. Nevertheless, in recent years, due to new environmental regulations (discussed below), organic and inorganic pigments are becoming more interchangeable. Pigments are also distinct from dyes,[8] and synthetic organic pigments are distinct from naturally occurring organic pigments.[9] This summary will discuss only synthetic organic pigments (also referred to as organic pigments).

Synthetic organic pigments have been classified (or differentiated) by one or more of the following methods—color, end use, lakes vs. toners,[10] and chemical structure. The definitive source for classifying and cross-classifying pigments (as well as dyes) is the *Color Index*.[11] Color and end use[12] are

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[1] Throughout this summary, the terms "synthetic organic pigments" and "organic pigments" will be used interchangeably. See section on Classification.

[2] However, the report will, at times, place this period in historical context by referencing information from earlier periods.

[3] According to the USITC publication, *Synthetic Organic Chemicals: United States Production and Sales, 1994*, November 1995, p. 2-1, U.S. organic pigment sales ($848 million) in 1994 accounted for less than 1 percent of total U.S. organic chemical sales ($101 billion).

[4] The major end-use markets (inks, coatings, and plastics) that the organic pigments industry serves are also mature.

[5] Industry analysts report that in most markets in the industrialized world, there are domestic producers that play a significant role in their own markets, although they don't operate on a multinational scale.

[6] See the section **Principal Suppliers and Import Levels** for a discussion of this trend.

[7] Color Pigments Manufacturers Association, Inc., "Pigments—A Primer," reprinted from *American Ink Maker*, June 1989.

[8] Pigments are essentially chemically inert. In addition, they are not soluble and need to be dispersed before being used in inks, paints, and plastics. Dyes, on the other hand, are more reactive and are generally solubilized in the process of being used. Dyes typically adhere to the substrate to which they are applied by adsorption, chemical bonding, or mechanical retention. See Color Pigments Manufacturers Association, Inc., *Pigments—A Primer*, 1989.

[9] The number of these naturally occurring organic pigments is, however, very small and commercially insignificant.

[10] A lake is an organic pigment produced by the interaction of a soluble dye, a precipitant, and an absorptive inorganic substrate. A toner is an insoluble pigment requiring no inorganic substrate. Toners are, by far, the largest category of pigments comprising more than 98 percent of U.S. production during 1991-95.

more intuitive classification methods for aggregate statistics,[13] while lakes vs. toners is a minor technical classification method. On the other hand, structural classification, which endeavors to group pigments according to structural similarity, is the most comprehensive and technical classification system. It is also the classification system most relevant to the manufacturing process. Nonetheless, all classifications are, to some extent, interrelated.[14] Chemical structure influences both color and physical properties; physical properties, in turn, influence end use. Some important organic pigment chemical classes, and their most common colors, are presented in the following tabulation:[15]

Pigment Class	Main Color
Anthraquinones	Yellow, red, violet, blue.
Azos	Yellow, orange, red, brown.
Dioxazines	Violet.
Indigoids	Red.
Isoindolidines	Yellow, orange, red.
Nitros	Yellow, brown.
Nitrosos	Green.
Perylenes	Red.
Phthalocyanines	Blue, green.
Quinacridones	Orange, red, violet.
Quinolines	Yellow.
Triarylmethanes	Violet, blue, green.
Xanthenes	Red, violet.

In the United States, commercially significant chemical classifications include the azos, phthalocyanines, quinacridones, and perylenes.[16]

Official statistics do not consistently present production and trade data by any of these classifications.[17] Therefore, even though end-use competition among pigments is based on color and physical properties, only aggregate statistics for production, imports, and exports will be presented in this summary's tables. Throughout the report, however, less aggregated estimates of certain statistics, made by industry analysts, will be presented. The 1991 world market share estimates of selected individual organic pigments and pigment classes are presented in figure 1.

Chemical Synthesis

An organic pigment is the final product in a series of chemical reactions. The basic raw materials used in producing synthetic organic pigments are commodity petrochemicals such as benzene, toluene, xylene, naphthalene, and ethylene. These are used to synthesize more complex commodity intermediates such as naphthalenesulfonic acid,[18] which are further reacted in a series of temperature- and pressure-controlled processes to produce the final organic pigment. Producing an organic pigment may easily require up to ten chemical reactions, from commodity chemical to the finished product. "Batch" production, rather than continuous production, is used due to the large number of separate, product-specific, chemical reactions required for each pigment.[19] Batch production requires considerable labor input, such as cleaning the equipment between batches. Hence, within the chemical industry, organic pigment manufacturing is considered to be among the more labor-intensive processes.

Once the basic pigment has been synthesized, it must undergo further finishing, or conditioning, to obtain the necessary chemical and physical properties required for a specific end use. The CPMA notes that:

> In the development of color pigments the chemical synthesis of the pigment is only the beginning. The real challenge comes in controlling particle size, shape, and surface and in conditioning the pigment to achieve optimal texture, dispersability, rheology, and other required properties. Much creative

[11] Pigments (along with dyes) are comprehensively classified and cross-referenced by chemical structure, generic name, and chemical constitution number in the *Color Index*, published under the auspices of the American Association of Textile Chemists and Colorists, Research Park, NC, and The Society of Dyers and Colourists, Yorkshire, England.

[12] The important commercial end uses are inks, coatings, and plastics.

[13] However, for each primary color such as red or blue, there are dozens of different distinguishable shades that are commercially important.

[14] Given the hundreds of organic pigments in existence, it is difficult to create a non-technical, transparent classification system.

[15] Obtained by Commission staff from various sources, including the *Color Index*.

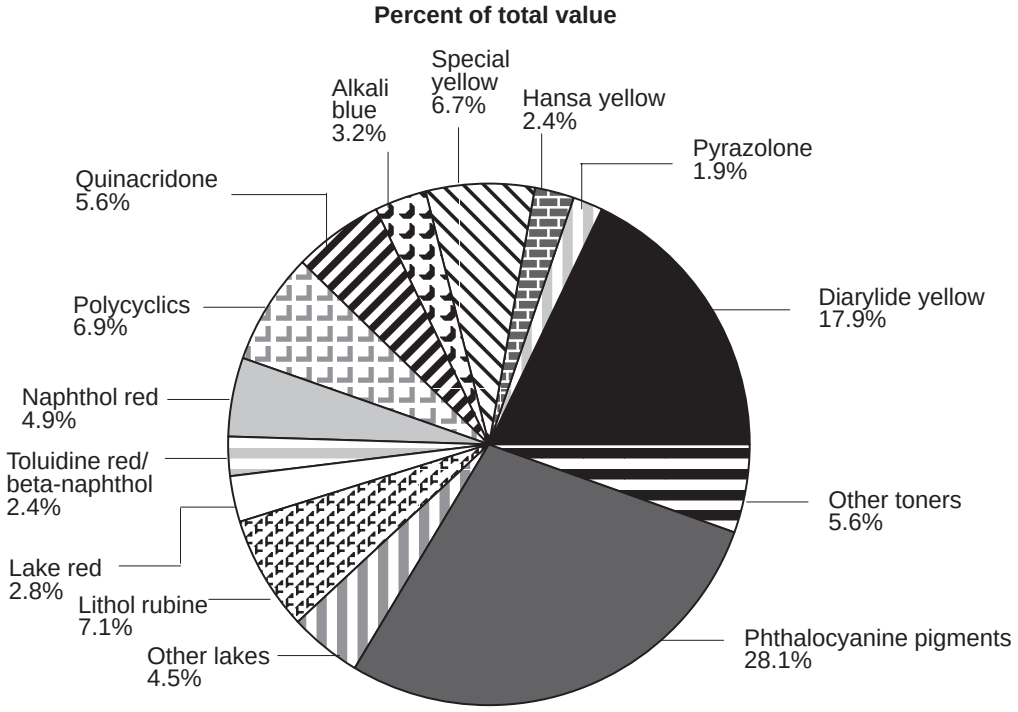
[16] Azo pigments, which are widely used in inks, coatings, and plastics, are able to produce a large variety of colors, depending on the chemical intermediates used in their production. There are, however, only a few large-volume azo products. Phthalocyanine pigments,which are chemically stable, intensely colored, durable, and bleed-resistant, are the dominant pigments in blue and green. Although relatively expensive on a per kilo basis, their coating ability makes them economical. Quinacridone pigments are expensive, but their high-performance characteristics, bleed resistance, chemical stability, light fastness, and high color intensity make them suitable for quality paints (such as those used on automobiles). Perylene pigments are also used in automotive paints, due to their excellent physical and coating characteristics.

[17] Synthetic Organic Chemicals, U.S. Production and Sales, published by the Commission from 1916 through 1994, was the only attempt to present official statistics by color and structure.

[18] Historically, there have been hundreds of pigments made using hundreds of chemical intermediates. The method used to classify these intermediates is not straight forward.

[19] Two exceptions are phthalocyanine blue and alkali blue, which are made in continuous processes.

Figure 1
Synthetic organic pigments: 1991 world market share of selected pigments and pigment classes



Source: *American Ink Maker,* Nov. 1992, p. 38-9.

effort has gone into the modification of pigments to improve their chemical and physical properties. Color pigments are customarily marketed on the basis of performance, rather than chemical analysis. Thus, the choices of colorants for individual products have been optimized by extensive testing and experience.[20]

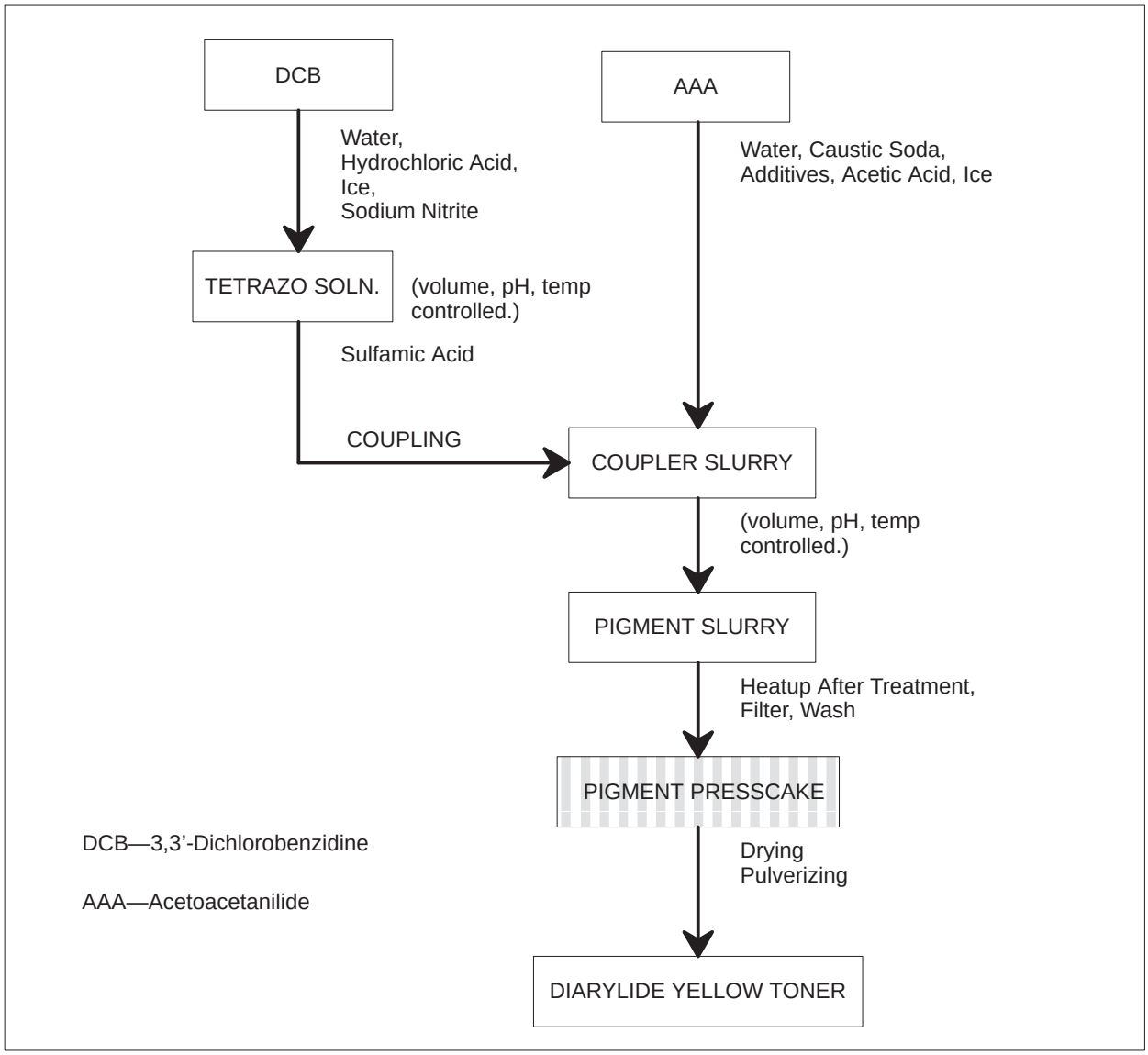
Currently, R&D efforts are focused more on finishing techniques than on creating new pigment molecules. Finishing may involve chemical and physical treatments. Chemical treatment refers to the addition of chemicals which, even though they do not participate in creating the original pigment, can modify the color or physical properties of the final product. Physical treatment can involve grinding or other methods to control crystal form and particle size. Once "finished," the pigment presscake (water-wet paste or granules) may be dried, further extended, flushed, or made into a dispersion.

Flushing is a process that replaces the water in a presscake with an organic vehicle system such as a varnish, a wax, a plastic, or an oil. Flushed colors are an important product line in inks. However, pigments are also marketed as dry powders, presscakes, fluidized dispersions or slurries (pourable pastes), color paste concentrates (pastes), resin bonds or predispersions (powders), plastic color concentrates in granular form, and surface-treated powders or pastes.

It is possible, using various finishing techniques, to modify a specific, molecularly defined pigment for use in different applications. The characteristics that determine a pigment's performance include chemical and physical stability, color fastness, particle size and surface area, light-absorbing qualities, and resistance to bleeding and solubility. High-performance pigments typically retain their color under extreme physical conditions. Therefore, they are often used in organic coatings where resistance to fading is important (such as automobile paints), and in plastics applications where they are subject to intense heat. Some typical steps involved in the manufacture of one specific pigment, diarylide yellow 12, are shown in figure 2.

[20] CPMA, *Safe Handling of Color Pigments,* 1993, p. 2.

Figure 2
Diarylide yellow 12 pigment manufacture



Source: Reprinted with permission from the *American Ink Maker*, June 1993, p. 61.

U.S. INDUSTRY PROFILE

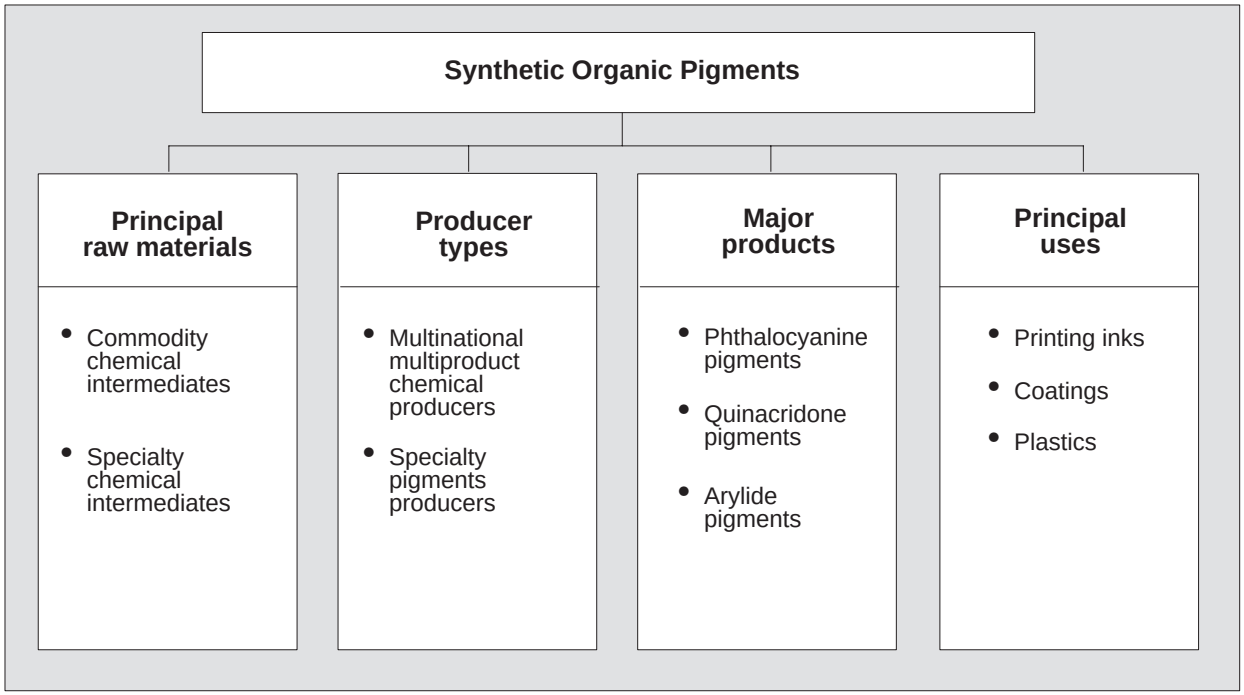
Industry Structure[21]

The principal raw materials, producer types, major products, and principal uses pertaining to the U.S. synthetic organic pigments industry are shown in figure 3. By the mid-1970s, the U.S. synthetic organic pigments industry, which originated in Europe and the United States prior to World War I,[22] had matured. Today, the synthetic organic pigments industry is a specialty segment of the chemical industry that accounts for only a small portion of total chemical industry sales; moreover, for the larger multinational companies, synthetic organic pigments sales account for a relatively small portion of each company's total

[21] The products covered in this summary correspond approximately with those of SIC 2865, Organic Crudes and Intermediates, and Organic Dyes and Pigments.

[22] Synthetic organic pigments were first produced in the United States at the end of the 19th century. The first products were lakes derived from synthetic organic dyes. The synthetic dyes and pigments industries were the first to make commercial use of synthetic organic chemistry.

Figure 3
U.S. synthetic organic pigments industry: Principal raw materials, producer types, major products, and principal uses



Source: Compiled by the staff of the USITC from various sources.

sales. In addition to large multinational companies, there are a number of smaller pigment companies in the United States (and throughout the world) that specialize in a few product lines, but are, nonetheless, significant participants in their respective national markets.[23] Industry sources indicate that smaller companies can establish excellent reputations for quality pigments in small niche markets, or sell a few products at very competitive prices. Questionnaire data collected by the Commission[24] show that of 31 companies reporting in 1994, 17 companies reported manufacturing 10 or fewer products. Since 1991, the industry has annually employed about 6,000 workers in producing and marketing organic pigments.

Table 1 lists the principal companies that manufactured synthetic organic pigments in the United States during 1994. In 1994, seven producers reported company sales of over $50 million and had a combined market share of 73 percent. Four of these companies were subsidiaries of foreign multinationals, and three were U.S. companies (none of which were truly multinational).[25] In terms of production, seven companies reported producing more than 2 million kilograms of product in 1994 and had a combined market share of 80 percent. Three of these companies were subsidiaries of foreign multinationals and four were U.S. companies. However, there are no published data on the amounts of pigments the firms imported, exported, or eventually sold in the United States. Because pigment manufacturers typically specialize in only one or two pigment classes, domestic submarket concentrations could be higher than the aggregate market shares indicate.[26]

A number of production facilities in the United States are located in historic, chemical-producing

[23] There appears to be a trend for most companies to specialize in a few product lines.
[24] USITC questionnaire data for the publication, *Synthetic Organic Chemicals, U.S. Production and Sales, 1994*.
[25] Although E.I. duPont, a multinational, is listed in table 1 as a U.S. producer, it is not a major participant in the organic pigments industry.
[26] On the other hand, the presence of independent importers and relatively high cross price elasticities among pigments (particularly the lower performance pigments) likely maintain a significant degree of competition.

Table 1
Synthetic organic pigments: U.S. producers in 1994[1]

Allegheny Chemical Corp	Keystone Color Works, Inc.
Apollo Colors Inc.	Magruder Color Co., Inc.
Barker Fine Color, Inc.	Max Marx Color Corp.
BASF Corp.	Miles, Inc.
CDR Pigments & Dispersions	Paul Uhlich & Co., Inc.
Ciba-Geigy Corp.	Pfister Chemical, Inc.
C. Lever Co. Inc.	PMC, Ink. Specialities Group Inc.
CPS	R-M Industries
Diacolor-Pope	Roma Color Inc.
E.I. duPont de Nemours & Co., Chemical & Pigments Department	Sandoz Chemicals Corp.
Engelhard Corporation	Spectrachem Corp.
Fabricolor Manufacturing Co.	Sun Chemical Corp.
Galaxie Chemical Corp.	Synalloy Corp., Blackman Uhler Chemical Div.
Hilton Davis Chemical Co.	United Color Manufacturing, Inc.
Hoechst Celanese Corp.,	Warner Jenkinson Co.
Indol Color Co. Inc.	
Industrial Color, Inc.	

[1] Data from Cookson Pigments were not included in the 1994 report.
Source: USITC, *Synthetic Organic Chemicals, U.S. Production and Sales 1994*, Nov. 1995.

areas, such as the East Coast and Midwest. However, in the United States, geography imposes no real strategic or financial constraint on plant location. Furthermore, because of economies of scale, a specific pigment may be produced in one location and then shipped throughout the world for formulation and distribution in local markets. Location becomes a more strategic factor at the formulation and distribution level, as the need to offer technical service and maintain contact with customers becomes more important.

Some multinational organic pigments producers also manufacture advanced intermediates and commodity chemical precursors such as benzene, toluene, and naphthalene. This group of producers is quite small in number because it is more economical for most pigments producers to purchase their raw materials and intermediates than to manufacture them.[27] Although a few large companies have integrated their pigments production downstream into ink production, downstream integration is the exception. Virtually all the smaller companies produce only synthetic organic pigments.[28]

Costs, Pricing, and Distribution

Manufacturing the basic organic pigment molecule uses chemical reactions and processes that are well known and require little modification, once developed. However, end-use applications are continuously changing and pigment companies are constantly using research and development funds to meet the changing end-use application technologies.[29] In recent years, two factors in particular have affected the costs, production schedules, and competitiveness of the pigments industry in most of the world's developed countries — (1) the cost and uncertain availability of chemical intermediates and (2) stricter environmental regulations.[30]

During the manufacturing process, certain advanced chemical intermediates are produced that (1) are critical to a specific class of pigments, (2) have their own markets, and (3) are traded worldwide. Industry analysts note that these intermediates can account for up to 60 percent of the cost of a pigment; therefore, their cost and availability play an important role in a pigment's price competitiveness. Two such intermediates, 3,3'-dichlorobenzidine and aceto-acetanilide, are listed in figure 2. A third important intermediate is crude copper phthalocyanine,[31] which

[27] This situation is partly due to economies of scale, in which the low cost intermediates are produced in quantities much larger than those required to manufacture a single company's organic pigments. Furthermore, for many companies, manufacturing chemical intermediates is itself a viable, although internationally competitive, industry undergoing rapid change.

[28] Sun Chemical Company (which is part of a Japanese multinational) is an example of a large U.S. organic pigments producer that is integrated downstream into inks.

[29] Industry analysts suggest that only 5 to 10 percent of currently used pigments are covered by patents. There may, however, be patents and effective trade secrets concerning pigment additives and production processes.

[30] A third competitive issue, imports from developing countries such as India and China, has imposed pressure on some prices.

[31] Although not strictly a pigment, it has its own HTS subheading in heading 3204.17 (table 8).

is used in the production of as much as 25 to 30 percent of U.S. pigments.

Starting in the early 1980s, several major manufacturers of chemical intermediates in developed countries (e.g., American Cyanamid, BASF, Hoechst-Celanese, Sandoz, and Sumitomo) discontinued producing many of these products. Prices of chemical intermediates reportedly increased, in part due to supply shortages, but also due to increased regulations in Western Europe, Japan, and the United States.[32,33] Analysts contend that even if suppliers want to return to the business, the capital cost of building new plants could not be justified, and precursors for the intermediates would be difficult to obtain. To counter these reported price increases and remain competitive in the world market, many U.S. (and other industrialized countries') pigment producers sought new supply sources in developing countries and/or temporary suspension of U.S. duties on imported intermediates. To date, however, the developing countries do not have sufficient capacity.[34] Furthermore, many of these countries are starting their own pigments industries, which require domestically produced intermediates. Beginning in 1994 and extending well into 1995, there reportedly was a pronounced increase in prices, with some intermediates or precursors posting double-digit increases. It has been reported that intermediates prices have increased on average about 20 percent since 1990.

The second competitive issue reportedly started in the mid 1970s, when environmental and occupational health and safety regulations began to affect the cost of manufacturing organic pigments.[35] By the 1990s, these regulations had become a factor in industry decision-making, causing industry to cease producing some products, to alter the product mix as companies sought more environmentally friendly products, and to generally increase production costs.[36] Some regulations were directed toward the use and handling of specific pigments, while others focused on larger environmental issues (such as air and water quality), which affected significant portions of the organic pigments industry. More recently, a wide range of pigments currently on the market (both organic and inorganic) is undergoing environmental and toxicological review in the United States, Japan, and Western Europe. In response, companies are focusing research and development funds on making alternative environmentally friendly products. The U.S. pigments industry has identified those Federal agencies having primary responsibility for pigment regulation (table 2).[37]

Although production costs have reportedly increased significantly due to evolving environmental regulations, industry analysts state that it is difficult to quantify a company's environmental costs on a product basis because for most companies, capital expenditures are likely to be applied to many products and human resources are likely to be spread over many functions.[38] Nonetheless, at a recent conference, one company shared its experience, which is reproduced in figure 4.[39]

Sales of synthetic organic pigments in the United States take place through one of three distribution channels, in decreasing order of importance (1) directly from producer or importer to pigment consumer, (2) indirectly through distributors, or (3) indirectly through other pigment manufacturers. Sales through other pigment manufacturers benefit both producers. The company making the sale maintains a customer, while the manufacturer having the pigment on hand sells the product "off the shelf" without supplying technical service. Generally, all three distribution channels offer technical service, although service provided by distributors is usually limited.[40]

Most dry pigments in the United States are packaged in paper bags of 25, 50, or 55 pounds. Steel drums and fiber drums are also used, as are large bags containing hundreds of pounds and shipped on pallets. Flushes (pigments finished in an oil-based solvent) are supplied in drums. Published list prices are available;

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[32] For a more complete discussion of the issues presented in this paragraph, see Hope Gains, "The Sunny Side of Pigments," *American Ink Maker*, June 1995, pp. 12-18, Andy Teng, "Raw Materials Report," *Ink World*, Sept./Oct. 1995, pp. 42-46, and Andy Teng, "Pigments Market," *Ink World*, Mar. 1996, pp. 44-50.

[33] These were many of the same regulations that were applied to finished pigment production. Further, regulations were beginning to be developed in the Republic of Korea and Taiwan.

[34] As one analyst noted, if developing countries could manufacture sufficient quantities of low-priced intermediates, then the U.S. pigments industry could become very competitive.

[35] Gains, "The Sunny Side of Pigments"; Teng, "Pigments Market"; and Teng, "Raw Materials Report."

[36] More accurately, these regulations were directed at the chemical manufacturing and chemical using industries in general; the organic pigments industry was only one industry segment affected by the regulations.

[37] For a discussion of how the industry is addressing these issues, see Harold F. Fitzpatrick and Glenn Merrit, "Current U.S. Regulatory and Legislative Developments Affecting Color Pigments," American Ink Maker, Apr. 1996, pp. 100-117. See also A. Conte, "Regulatory Challenges: Using Some Common Sense," American Ink Maker, Apr. 1995, pp. 12-22.

[38] Information obtained in field interviews conducted in March 1994. For example, a waste water treatment facility could be applied to the whole chemical complex; a plant manager may, from week to week, spend varying amounts of time on regulatory activities and production activities. Companies with more resources and more products may be able to allocate these resources to more products (economies of scope) and may be more competitive in a regulated environment.

[39] Andrew Zamoyski, technical manager, Hoechst Celanese. Excerpt of a speech printed in "Environmental Pigments '93," *American Ink Maker*, June 1993, p. 37.

[40] Information obtained from field interviews held in March 1994.

Table 2
Synthetic organic pigments: Federal agencies having regulatory responsibility

The Environmental Protection Agency (EPA):

The EPA is the principal Federal agency that promulgates regulations that restrict the emission of toxic substances in air, water, and from solid waste. EPA regulations that affect the synthetic pigments industry are issued principally under the following acts:

Clean Air Act: Section 111, Volatile Organic Compounds
Resource Conservation and Recovery Act (RCRA): Hazardous Waste Regulations and Land Disposal Prohibitions
Clean Water Act
Superfund Amendments and Reauthorization Act of 1986 (SARA): Superfund Amendments and Reauthorization Act Title III, Section 313, Toxic Chemicals

The Consumer Product Safety Commission (CPSC):

The Commission helps protect the public from unreasonable risk in the use of consumer products. Among the products reviewed by CPSC are crayons and artists supplies, which are important to the organic pigment industry.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor:

The Administration is responsible for maintaining health and safety standards in establishments that manufacture products, including synthetic pigments.

United States Department of Agriculture (USDA):

The USDA, among other things, sets standards for the use of pigments in coatings and packaging for meats and poultry.

Food And Drug Administration:

FDA, among other things, regulates pigments that are used to color food packaging, drugs, cosmetics, and medicines.

Source: CPMA, *Safe Handling of Pigments*, 1993, ch. 1.

however, they are seldom definitive and prices are subject to change based on supply[41] and demand. Quantity discounts are also a significant pricing determinant. Average per-kilo unit values for all organic pigments during 1990-94 are given in the following tabulation:[42]

Year	Unit value
1990	$16.01
1991	$16.32
1992	$17.22
1993	$17.39
1994	$17.54

[41] For example, a recent change in supply was caused by changes in the supply of intermediates.

[42] Average prices listed in USITC, *Synthetic Organic Chemicals, U.S. Production and Sales*, corresponding years. The 1995 unit value was not available at the time of this summary.

Annual average unit values are only of limited use, however, because they do not convey the price distribution among the many individual products. The following tabulation indicates the considerable price variation that exists among pigments, even within the same end use.[43]

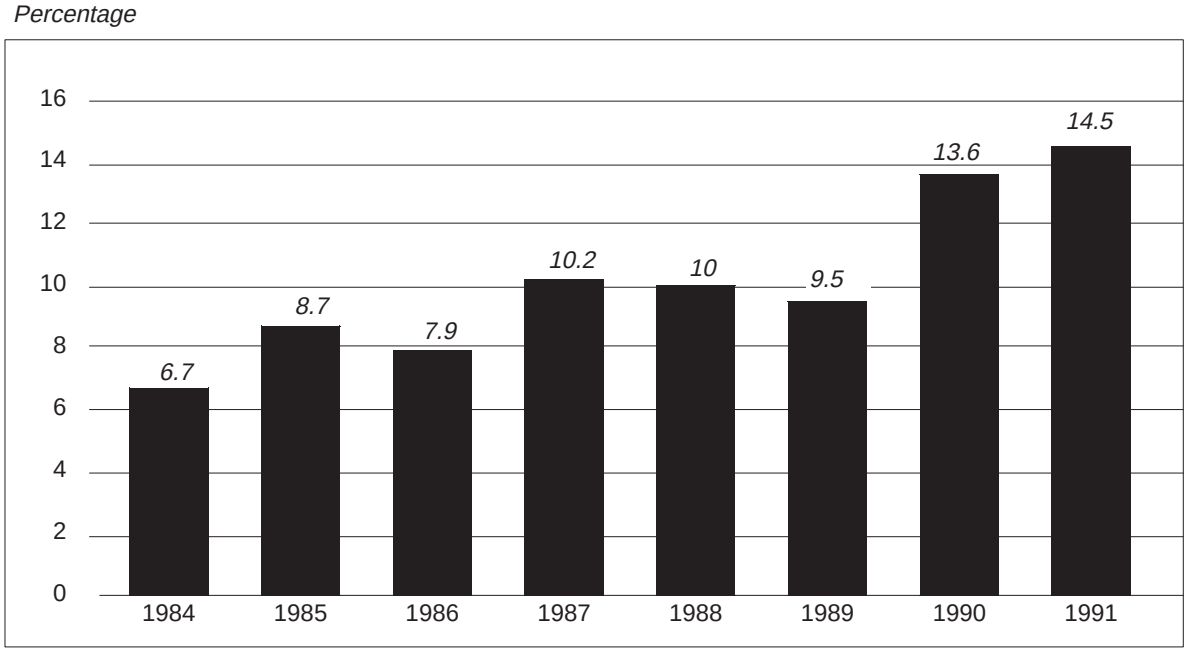
End-use market	Per kilo price range
Automotive coatings	$22 to $110
House paints	$11 to $24
Printing inks	$22 to $66

Among house paints and printing inks, average prices were weighted more toward the lower end.

Because most end uses have strict performance requirements, organic pigments are marketed on the

[43] Information obtained from field interviews held in March 1994.

Figure 4
Synthetic organic pigments: One company's environmental protection costs, as a percent of turnover, 1984-91



Source: *American Ink Maker*, June 1993, p. 37.

basis of color and performance. Simply substituting one pigment for another pigment of the same color, with no consideration for physical properties, is likely to compromise performance. In general, performance determines the price of the pigment, and many high-performance pigments are more expensive to manufacture.

In addition to production costs, pricing is influenced at the retail level by distribution and marketing costs, which vary from product to product. With high-performance products, manufacturers are likely to offer technical service, whereas with commodity pigments, distributors more often supply the technical information.

Restructuring

Beginning in the late 1970s, the industry underwent considerable restructuring. Some large U.S. multinational companies, such as DuPont[44] and American Cyanamid, effectively ceased producing organic pigments, while certain foreign-based multinational companies strengthened their U.S. world positions. Industry analysts have identified five large foreign multinational companies (Hoechst Celanese, BASF, Ciba-Geigy, Sun Chemical, and Bayer) as having become world leaders with established production facilities throughout the world, including Europe, India, Mexico, Japan, South America, the United States, and Australia.[45] Table 3 lists some of the restructuring that occurred in the U.S. organic pigment industry during the 1980s and 1990s.

Industry restructuring occurred in the context of the promulgation of stricter environmental regulations, increased foreign competition, and significant tariff reductions. These three events encouraged closing obsolete plants, rationalizing production to improve competitiveness, and facilitating international trade by reducing the barriers to trade. Industry analysts assert, in particular, that the 20-percentage point tariff reductions negotiated during the Tokyo Round of the General Agreement on Tariffs and Trade (GATT) and phased in during the 1980s[46] exposed U.S. producers to new competitive pressures that had been previously buffered by high tariffs relative to the U.S. average.[47]

[44] Strictly speaking, DuPont has produced small quantities of organic pigment (table 1), but the company is not the major producer it was prior to 1983. See table 3.

[45] Information obtained during field interviews held in March 1994.

[46] Rates fell from a range of 28 to 40 percent to a range of 8 to 20 percent in 1994.

[47] "Color the Market Green," *Chemical and Engineering News*, Sept. 1991, p. 53.

Table 3
Synthetic organic pigments: U.S. industry restructuring, 1983-96

* 1983—DuPont (U.S.) exits the synthetic organic pigments industry, selling its facilities to Ciba Geigy (Swiss) and Heubach (German), and its technology to Toyo Ink (Japanese).

* 1985—BASF (German) purchased Inmont Corporation, a leading printing ink company, from United Technologies (U.S.).

* 1986—Dainippon (Japanese) purchases Sun Chemical Company (U.S.).

* 1987—Flint Ink (U.S.) acquires majority ownership of Ridgway Color (U.S.).

* 1989—Heubach (German) is sold to Cookson America Inc. (British).

* 1990—Binney & Smith Inc. (U.S.) discontinued pigment production.

* 1990—The Mobay subsidiary (and other subsidiaries) of Bayer U.S.A. combined to form a company called Miles Inc. (German).

* 1992—Paul Uhlich & Company (U.S.) became Uhlich Color Company Inc. (U.S.)

* 1992—Three subsidiaries of Flint Ink Corporation (U.S.), Chromatocolor Ridgway Color (U.S.), and Draw Graphics (U.S.) were merged into a company called CDR (U.S.).

* 1992—Miles (German) opened a new pigments plant in Bushy Park, SC.

* 1993—Miles (German) closed its Haledon, NJ plant.

* 1995—Miles (German) changes name back to original name, Bayer.

* 1996—BASF (German) sells printing ink pigments plant to CDR (U.S.).

Source: Obtained by the staff of the USITC from various sources.

U.S. MARKET

Consumer Characteristics and Factors Affecting Demand

The approximate percentage of synthetic organic pigments use (by volume) during 1991-95, by market, is given in the following tabulation:

Market	Percent
Inks	60
Paints and coatings	25
Plastics	10
Other	5

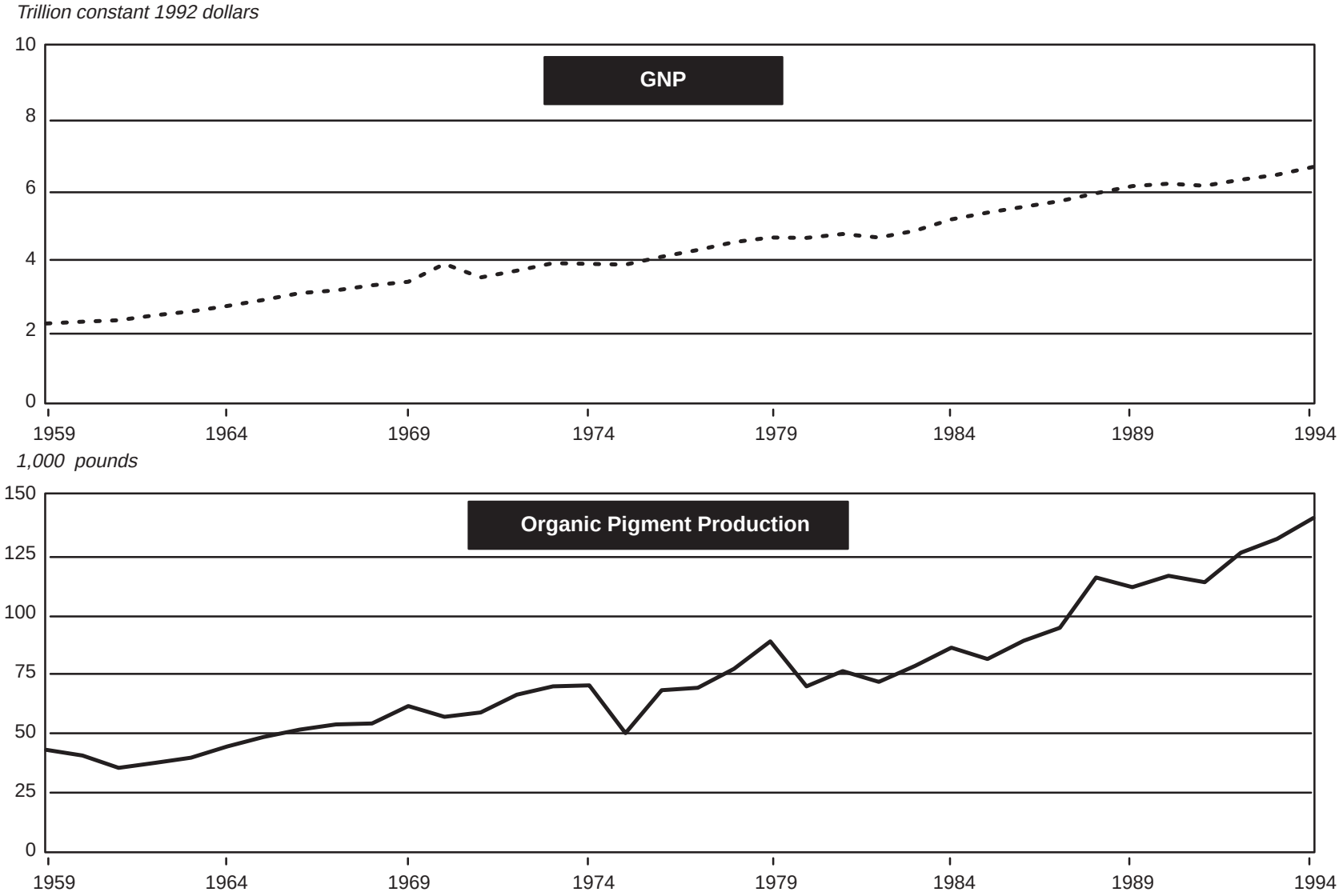
Historically, demand for both ink and coatings is significantly influenced by the business cycle, which has been relatively strong during much of the 1990s (figure 5). When the economy is strong, companies are more likely to use expensive advertising and packaging, which are major end uses of ink. In slower periods, these two activities are often curtailed. The automobile and housing industries, which are the primary users of paints and coatings, are also significantly influenced by the business cycle. However, the relationship is far from exact and many short-run factors can influence the demand for organic pigments.[48]

Consumption

The value of apparent U.S. consumption of synthetic organic pigments, in current dollars, increased by 39 percent during 1991-95, from $845 million to $1.2 billion (table 4 and figure 6). Ink producers were the major consumers of these pigments during this period, accounting for approximately 60 percent of U.S. consumption, while coatings

[48] For example, industry analysts reported that in 1995, there was concern that a recent increase in the price of paper would induce advertisers to rely more heavily on electronic media; in 1996, they thought that print advertising related to the Olympic Games in Atlanta would increase, at least temporarily, the demand for pigments used in inks.

Figure 5
U.S. Gross National Product and organic pigment production, 1959-94



Source: *Economic Report of the President*, February 1996 and *U.S. Synthetic Organic Chemicals, U.S. Production and Sales*.

Table 4
Synthetic organic pigments: U.S. production, exports of domestic merchandise, imports for consumption, and apparent consumption, 1991–95

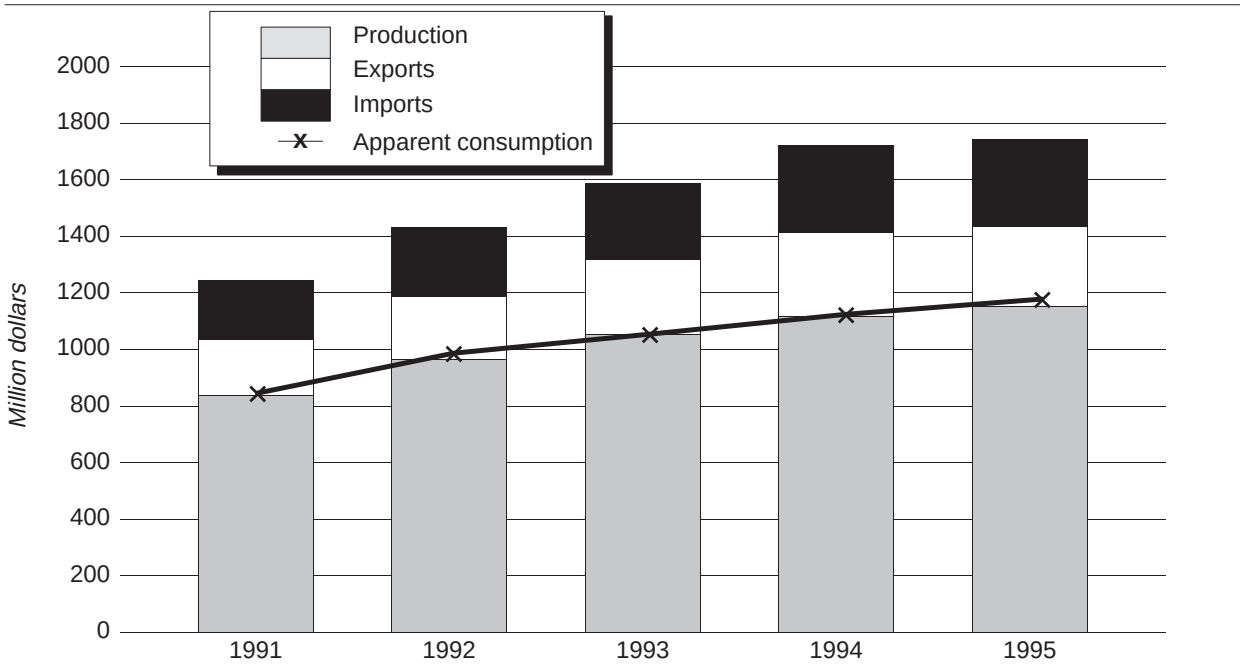
Year	U.S. production[1]	U.S. exports	U.S. imports	Apparent U.S. consumption	Ratio of imports to consumption
		Million dollars			*Percent*
1991	837	200	208	845	25
1992	965	223	244	986	25
1993	1,053	267	267	1,053	25
1994	1,116	299	306	1,123	27
1995[2]	1,154	283	306	1,177	26
		Thousand kilograms			*Percent*
1991	51,311	21,776	13,793	43,328	32
1992	56,944	24,710	15,087	47,321	32
1993	59,599	29,822	17,222	46,999	37
1994	63,560	35,036	18,250	46,774	39
1995[2]	65,000	34,974	18,781	48,807	38

[1] U.S. production data obtained from USITC publication, *Synthetic Organic Chemicals, United States Production and Sales*, various years.

[2] 1995 U.S. production estimated.

Source: Compiled from official statistics of the U.S. Department of Commerce, except as noted.

Figure 6
Synthetic organic pigments: U.S. production, exports of domestic merchandise, imports for consumption, and apparent consumption, 1991-95



Source: Shipments obtained from USITC, *Synthetic Organic Chemicals, United States Production and Sales,* various years. Exports and imports compiled from official statistics of the U.S. Department of Commerce.

manufacturers were the second largest consumer group, accounting for approximately 25 percent of consumption. However, trends in organic pigments consumption, in terms of quantity, exhibited more cyclical behavior during 1991-95, declining in 1993-94, after a large increase in 1992 (which followed a slowdown in the economy in 1990 and early 1991). U.S. exports were exceptionally strong in 1994. Industry analysts have stated that production and sales in 1994, and in the first few months of 1995, were exceptionally strong. According to one commentator, "From a historical perspective, 1994 was a year when demand for pigments out-stripped the capacity to produce and could very well be a high watermark for capacity utilization."[49]

Production

The value of U.S. aggregate production of synthetic organic pigments, in current dollars, increased by 38 percent during 1991-95, from $837 million to an estimated $1.2 billion. Growth in value during the period was fairly constant following the economic downturn in 1990 (table 4). In terms of quantity, U.S. production followed a similar pattern.

U.S. TRADE

Overview

The U.S. organic pigments trade balance[50] deteriorated slightly from a $49 million deficit in 1991 to a $51 million deficit in 1992.[51,52] The deficit then decreased to $27 million in 1993 but increased in 1994 and 1995 to $40 million and $58 million, respectively. The U.S. deficit with the EU accounted for 73 percent to 93 percent of the total U.S. trade deficit during the period. U.S. trade with the EU and Japan reportedly reflected the extensive intracompany trade between the domestic and foreign operations of U.S., European, and Japanese companies.[53] At the country level, the United States posted an increasing deficit with Germany and fluctuating deficits with Japan and Switzerland. On the other hand, the United States maintained constant and sizable trade surpluses with Canada, Belgium, and Mexico.

The pie charts in figure 7 further highlight the extent of organic pigments trade between the United States and other developed countries. However, some analysts believe that, with increased environmental compliance costs and high labor costs relative to those found in developing countries, there may be further restructuring of the U.S. industry, and some foreign multinationals will enter into joint ventures in developing countries. According to industry sources, imports from China and India are expected to continue to increase in the future, thereby maintaining competitive pressure on the U.S. industry.[54]

U.S. Imports

Principal Suppliers and Import Levels

The principal suppliers of synthetic organic pigments to the United States have been Germany, Japan, Switzerland, and the United Kingdom, both historically and during 1991-95 (table 6). These four countries accounted for 73 percent of the value of organic pigments imports in 1995, while the four largest European suppliers of organic pigments (Germany, Switzerland, the United Kingdom, and France) accounted for 63 percent of U.S. imports. Japan, a major supplier of ink-related pigment imports, accounted for 16 percent of total organic pigment imports.

Mexico also supplies organic pigments to the United States. Given the presence of foreign multinationals (U.S. and European) in that country, it is difficult to determine what portion of these products are from domestically owned Mexican companies rather than from subsidiaries of traditional foreign suppliers to the U.S. market.

Industry analysts note that since many commodity organic pigments are off-patent, newly industrialized countries are likely to produce and export these commodity pigments. Industry analysts view Central Europe, with its historical connections to the original European pigment industry, as having the potential to be a large exporter of generic products, but they believe a significant portion of Central European exports will be destined for EU countries because of their proximity.

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[49] Andy Teng, "Raw Materials Report," *Ink World*, Sept./Oct. 1995, p. 42.

[50] Table 5 includes data on imports of crude phthalocyanine, not ready for use as pigments (HTS Subheading 3204.17.20), which are not included in other tables in this summary. Including these data in aggregate data tables leads to double counting. Traditionally, the synthetic organic pigments industry does not consider this product a finished pigment. Table 5 also includes data from HTS 3205 subheadings that traditionally the synthetic organic pigments industry does not consider to be true synthetic organic lakes, and therefore, are not included in table 6. See footnote 56.

[51] The trade data discussed in this paragraph are set out in table 5. The United States had, in fact, maintained a small positive trade balance in organic pigments in 1989 and 1990.

[52] Data in table 5 are organized according to countries with the largest trade turnover (exports and imports). Therefore, some countries listed in tables 6 or 9 may not be listed in table 5. Further, the country rankings (for exports or imports) may not be the same.

[53] Information obtained from field interviews held in March 1994.

[54] Information obtained from field interviews held in March 1994.

Table 5
Synthetic organic pigments: U.S. exports of domestic merchandise, imports for consumption, and merchandise trade balance, by selected countries and country groups, 1991-95[1]

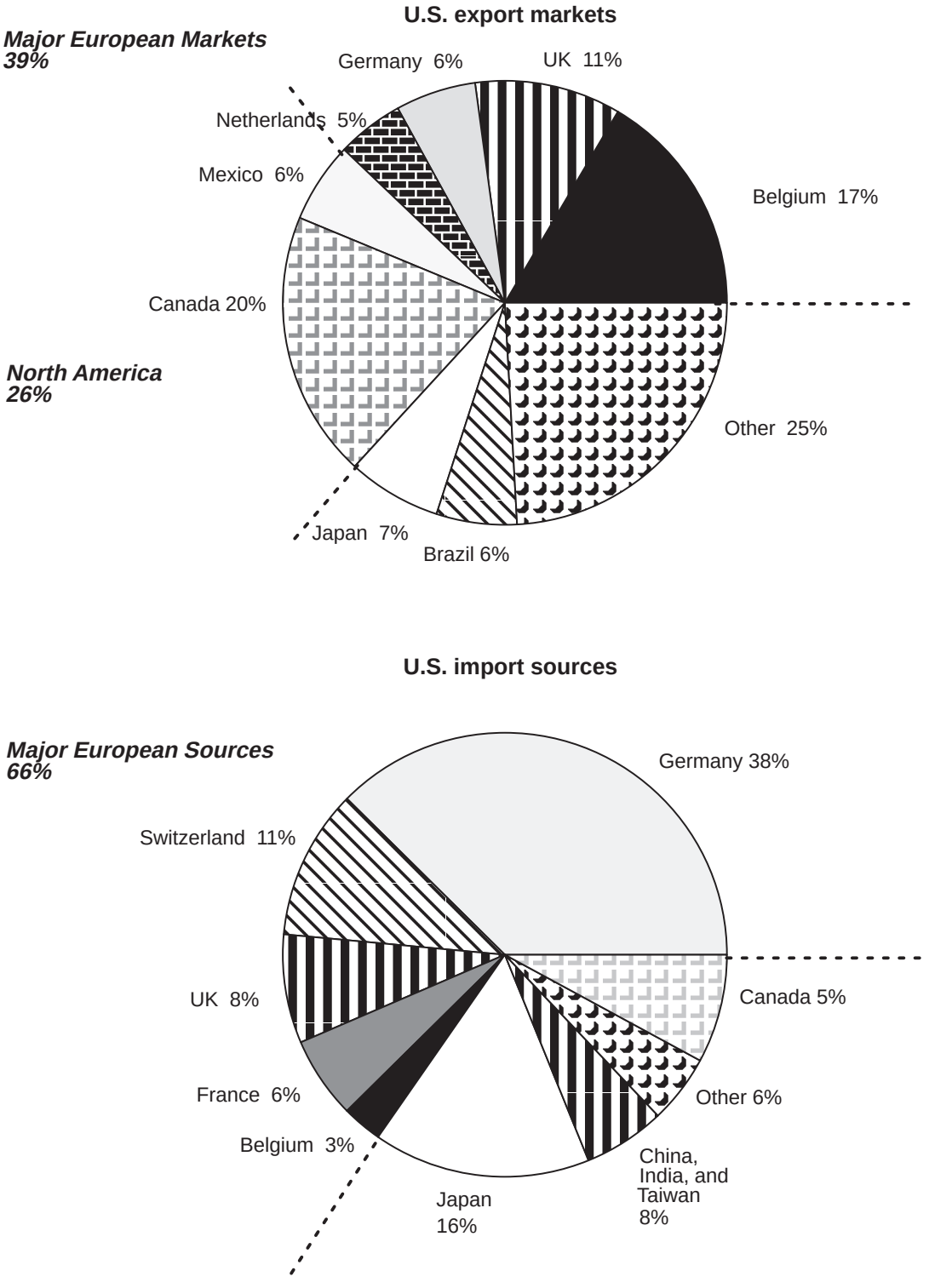
(Million dollars)

Item	1991	1992	1993	1994	1995
U.S. exports of domestic merchandise:					
Germany	22	19	15	19	18
Japan	18	15	17	18	21
Canada	32	40	49	53	54
United Kingdom	17	19	23	30	30
Belgium	33	37	57	66	48
Switzerland	6	9	14	19	2
France	5	5	6	9	6
Mexico	9	13	14	15	17
Korea	3	4	6	6	6
Brazil	4	5	6	9	17
All other	51	57	60	57	64
Total	200	223	267	299	283
EU-15	90	95	120	142	125
OPEC	5	4	5	3	4
ASEAN	3	4	5	4	3
CBERA	3	4	3	4	5
Eastern Europe	0	0	0	0	o
U.S. imports for consumption:					
Germany	95	113	112	124	118
Japan	59	50	59	65	61
Canada	8	9	12	13	17
United Kingdom	17	21	23	25	24
Belgium	5	5	6	6	4
Switzerland	22	35	32	41	32
France	4	6	10	13	20
Mexico	4	3	2	3	4
Korea	14	11	11	14	14
Brazil	0	0	0	0	0
All other	21	21	27	35	46
Total	249	274	294	339	341
EU-15	126	150	154,	173	172
OPEC	2	1	2	3	5
ASEAN	3	3	21	3	7
CBERA	0	0	0	0	0
Eastern Europe	0	0	0	0	1
U.S. merchandise trade balance:					
Germany	-73	-94	-97	-105	-100
Japan	-41	-35	-42	-47	-40
Canada	24	31	37	40	37
United Kingdom	0	-2	0	5	6
Belgium	28	32	51	60	44
Switzerland	-16	-26	-18	-22	-30
France	1	-1	-4	-4	-14
Mexico	5	10	12	12	13
Korea	-11	-7	-5	-8	-8
Brazil	4	5	6	9	17
All other	30	36	33	22	18
Total	-49	-51	-27	-40	-58
EU-15	-36	-55	-34	-31	-47
OPEC	3	3	3	0	-1
ASEAH	0	1	3	1	-4
CBERA	3	4	3	4	5
Eastern Europe	0	0	0	0	-1

[1] Import values are based on customs value; export values are based on f.a.s. value, U.S. port of export. U.S. trade with East Germany is included in “Germany” but not “Eastern Europe”.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Figure 7
Synthetic organic pigments: Major U.S. export markets and import sources, by value, 1995[1]



[1] Totals may not sum to 100%, due to rounding.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 6
Synthetic organic pigments: U.S. imports for consumption, by principal sources, 1991-95

Source	1991	1992	1993	1994	1995
	Quantity *(1,000 kilograms)*				
West Germany	4,551	5,054	5,446	4,901	4,413
Japan	3,047	2,638	3,105	3,166	3,004
Switzerland	562	861	802	1,099	839
United Kingdom	1,503	1,784	1,700	1,867	1,838
France	188	284	460	600	910
Canada	1,284	1,339	1,828	1,908	2,651
China	265	535	1,085	1,473	2,230
Belgium	479	492	597	589	704
India	112	132	357	513	397
Taiwan	660	632	787	776	473
All Other	1,141	1,316	1,053	1,356	1,265
Total Imports	13,793	15,087	17,222	18,250	18,781
	Value *(1,000 dollars)*				
West Germany	91,790	112,325	111,817	123,729	116,314
Japan	44,635	36,953	44,993	50,492	49,103
Switzerland	22,234	35,436	32,486	41,428	32,351
United Kingdom	17,020	21,301	23,378	24,612	24,170
France	3,977	6,085	9,612	12,870	19,654
Canada	7,762	8,639	11,693	12,843	16,732
China	1,559	3,179	6,099	7,691	12,224
Belgium	4,485	4,523	6,144	5,683	7,384
India	1,211	1,334	4,117	5,654	4,472
Taiwan	2,880	3,867	5,832	5,632	4,324
All Other	10,063	10,731	10,780	15,261	15,540
Total Imports	207,616	244,374	266,951	305,895	305,877
	Unit value *(dollars per kilogram)*				
West Germany	20.17	22.22	20.53	25.24	26.35
Japan	14.65	14.01	14.49	15.95	16.34
Switzerland	39.56	40.19	40.51	37.69	38.57
United Kingdom	11.32	11.94	13.75	13.19	13.15
France	21.20	21.42	20.90	21.44	21.60
Canada	6.04	6.45	6.40	6.73	6.31
China	5.88	5.94	5.62	5.22	5.48
Belgium	9.36	9.19	10.30	9.65	10.48
India	10.81	10.14	11.53	11.00	11.26
Taiwan	4.37	6.12	7.41	7.26	9.14
All Other	8.82	8.15	10.23	11.25	12.19
Total Imports	15.05	16.20	15.50	16.76	16.14

Source: Compiled from official statistics of the U.S. Department of Commerce.

High- and medium-performance synthetic organic pigments were reportedly the largest categories of organic pigments imported in 1995 (by value), accounting for approximately 60 percent of total imports, while the lower performance commodity pigments accounted for the remaining 40 percent.[55]

These proportions are generally representative of the whole period under study. Industry analysts note that a substantial portion of these products, particularly the high- and medium-performance products, were imports from multinational companies. Germany, Japan, Switzerland, and the United Kingdom are major suppliers of high-performance synthetic organic pigments and pigment intermediates.[56]

U.S. importers are typically either large multinational organic pigment companies or independent trading companies. Reportedly, the larger companies often import presscake from foreign affiliates to formulate and sell in the United States.[57] Industry analysts contend that the major multinational

[55] Some pigments included in these temporary suspensions were pigment red 214, pigment red 242, pigment blue 16, pigment green 36, and pigment yellow 155.

[56] Wilfried Mueller-Kaul, director of Marketing, Hoechst AG, quoted in the *American Ink Maker*, Aug. 1992, p. 50.

[57] "Are Pigments Profitable?", *American Ink Maker*, June 1991, p. 77.

pigment producers having production facilities in the United States account for up to 70 percent of U.S. imports. Imports of synthetic organic pigments from U.S.-owned foreign subsidiaries are believed to be minimal. The independent trading companies, on the other hand, are significant importers and likely to import foreign products from independent foreign suppliers, acting as intermediaries between the foreign suppliers (often from developing countries) and U.S. consumers.

Aggregate synthetic organic pigment imports, in current dollars, increased 47 percent during 1991-95, from $208 million to $306 million (table 6). The import share of consumption, in value terms, was basically steady during the period, at the 25-26 percent level. In quantity terms, the ratio increased from 32 percent to 39 percent during this period, compared with 25 percent in 1990. This change reportedly indicates that lower priced commodity pigments are beginning to be imported in larger quantities. Approximately 10 percent of imported pigments entered the United States free of duty under the U.S.-Israel Free Trade Agreement, the Generalized System of Preferences (GSP), or the Caribbean Basin Economic Recovery Act. Mexico was the chief GSP supplier in 1995. In addition, a few products entered the United States free of duty under temporary duty suspensions (before 1994) and permanently free of duty in 1995 (as negotiated during the Uruguay Round).[58]

China and India (and to a lesser extent Taiwan) have emerged as important non-European suppliers in the 1990s. As figure 8 indicates, each country increased its sales to the United States from less than $1 million in 1989[59] to over $7 million for India and $12 million for China in 1995. Taken together, India and China represented the sixth largest exporter to the United States in 1995, while their aggregate share of total imports increased from 3 percent in 1991 to 7 percent in 1995. These imports are reportedly commodity pigments, and so they represent a larger portion of some submarkets than the aggregate market share indicates. According to industry analysts, important to both India's and China's competitive position is their ability to maintain low unit values (particularly China) relative to the more advanced industrial suppliers. Industry analysts see this trend continuing with low unit values affecting prices of commodity pigments in the industry. Analysts also note that the immediate effect of increased Chinese imports is a downward pressure on a large number of lower priced pigments, resulting in reduced profit margins for domestic manufacturers.

[58] The issues discussed in this paragraph are based on information obtained from field interviews held in March, 1994.

[59] Information obtained from field interviews held in March 1994.

Import data for copper phthalocyanine, an intermediate chemical used to manufacture certain organic pigments (and having no other use), are presented in table 7.[60] As the data show, imports of copper phthalocyanine have fluctuated during the period, with Japan and Korea being the major sources. However, imports of this product from China have dropped steadily. Some industry analysts speculate that this decline reflects a shift by the Chinese from producing the intermediate for direct export to producing the intermediate for use in higher valued, domestically produced finished pigments.

U.S. Trade Measures

Tariff measures

Table 8 provides 1996 column 1-general rates of duty, preferential rates of duty, and 1995 U.S. exports and imports for each 8-digit Harmonized Tariff Schedule (HTS) provision covering the subject organic pigments.[61] The 1995 trade-weighted ad valorem equivalent (AVE) for these products was 15.2 percent.[62] In 1995, approximately 80 percent, by value, of synthetic organic pigments entering the United States were subject to duty rates greater than 8 percent ad valorem, and virtually all imports were subject to MFN tariff treatment. Currently, imports of these products from beneficiary countries under the Caribbean Basin Economic Recovery Act, the Andean Trade Preference Act, and the United States-Israel Free Trade Act are eligible for duty-free entry. Imports from Mexico and Canada under the NAFTA are subject to duties ranging from 5.8 to 14 percent ad valorem. However, with the exception of Canada, imports from these countries do not represent a large portion of total U.S. organic pigment imports.

Under the Uruguay Round of the Multinational Trade Negotiations, average U.S. column 1 general tariff rates for pigments will be reduced to approximately 6.5 percent ad valorem over a ten-year period. During the 1970s and '80s, Congress had enacted a number of temporary duty suspensions for individual synthetic organic pigments.[63] These

[60] The information contained in this paragraph was obtained from field interviews held in March 1994.

[61] All organic pigments entering the United States duty free under temporary duty suspensions were granted permanent duty-free status during the Uruguay Round.

[62] 1989 was the first year of significant supplies to the United States from these countries.

[63] Import data for copper phthalocyanine are presented in table 7, in part, to complement table 5 (the trade balance table), which combines pigments and copper phthalocyanine data. However, the aggregated data in tables 6 and 7 will not sum to the aggregated data in table 5. Data from certain HTS 3205 subheadings are not included in table 7, but are included in table 5. These subheadings are 3205.00.20 (in existence in 1991 through 1994); and 3205.00.05 and 3205.00.15 (in existence in 1995).

Table 7
Crude copper phthalocyanine: U.S. imports for consumption, by principal sources, 1991-95

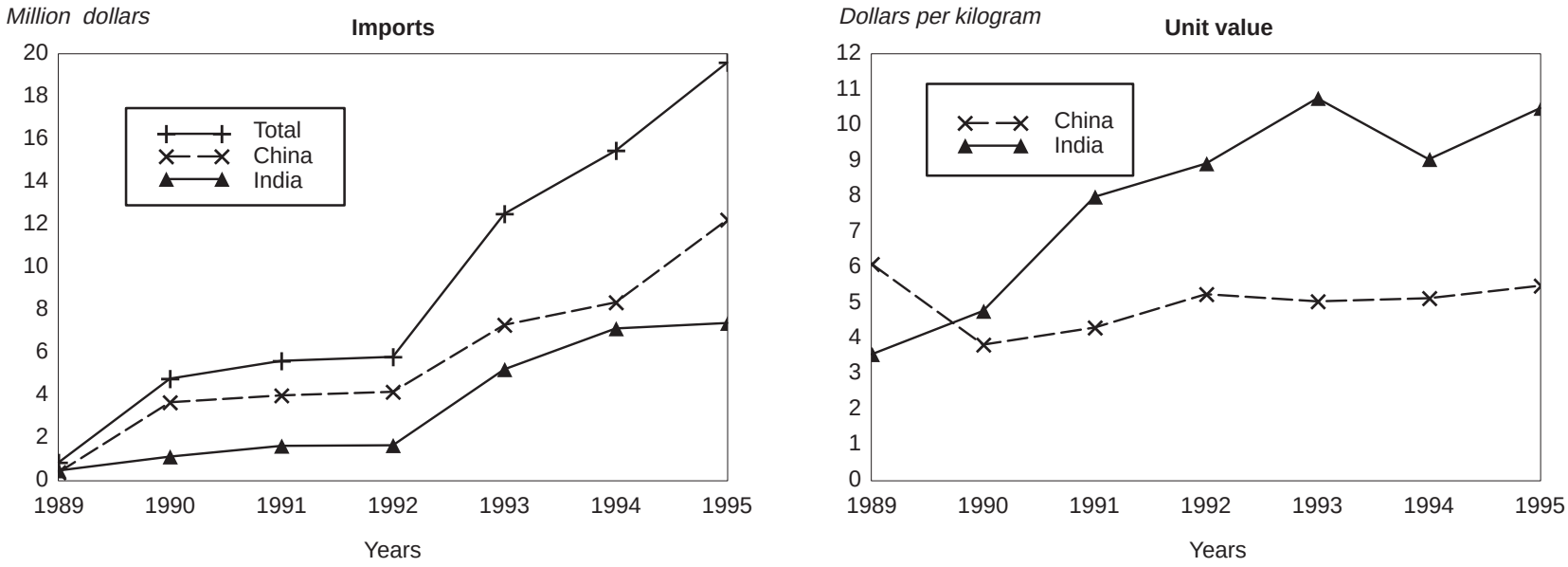
Source	1991	1992	1993	1994	1995
	Quantity *(1,000 kilograms)*				
Japan	3,146	2,740	3,049	3,732	2,469
Korea	2,419	2,030	2,052	2,979	2,775
Thailand	157	359	208	428	786
Indonesia	420	149	357	344	650
Germany, West	34	29	9	71	393
India	91	53	127	270	296
Italy	482	509	44	137	137
Spain	0	0	0	0	80
Hungary	0	0	0	72	126
China	661	257	362	156	104
All Other	655	182	23	70	71
Total Imports	8,065	6,307	6,232	8,259	7,888
	Value *(1,000 dollars)*				
Japan	13,822	12,736	13,417	14,491	11,490
Korea	10,895	8,280	7,677	10,148	11,445
Thailand	590	1,350	692	1,382	3,163
Indonesia	1,753	548	1,225	1,249	2,859
Germany, West	272	420	93	346	2,057
India	410	309	1,093	1,347	2,046
Italy	2,278	2,206	184	477	565
Spain	0	0	0	0	478
Hungary	0	0	0	256	478
China	2,424	972	1,199	662	425
All Other	3,142	790	166	451	363
Total Imports	35,586	27,611	25,746	30,809	35,369
	Unit value *(dollars per kilogram)*				
Japan	4.39	4.65	4.40	3.88	4.66
Korea	4.50	4.08	3.74	3.41	4.12
Thailand	3.77	3.76	3.33	3.23	4.02
Indonesia	4.18	3.68	3.44	3.63	4.40
Germany, West	7.95	14.29	9.88	4.83	5.24
India	4.51	5.87	8.59	4.99	6.90
Italy	4.72	4.34	4.19	3.47	4.11
Spain	0.00	0.00	0.00	0.00	5.94
Hungary	0.00	0.00	0.00	3.57	3.80
China	3.66	3.78	3.31	4.25	4.1
All Other	4.80	4.34	7.18	6.44	5.12
Total Imports	4.41	4.38	4.13	3.73	4.48

Source: Compiled from official statistics of the U.S. Department of Commerce.

suspensions reflected the lack of comparable, domestically available products. Under the Uruguay Round, the United States agreed to make permanent the temporary duty suspensions on pigments that were in effect prior to January 1, 1993 (a significant number of which expired December 31, 1992). The resulting changes to the HTS for pigments are reflected in the following tabulation (with duty rates shown as percent ad valorem):

1994 HTS subheading	Col. 1 - general rate	1995 HTS subheading	Col. 1 - general rate
3204.17.10	8.3%	3204.17.04	7.9%
		3204.17.08	Free
3204.17.30	15%	3204.17.40	Free
		3204.17.60	14.2%
3205.00.20	15%	3205.00.05	Free
		3205.00.15	14.2%

Figure 8
Synthetic organic pigments: U.S. imports and unit values from China and India, 1989-95



Source: Compiled from official statistics of the U.S. Department of Commerce.

Table 8
Sythetic organic pigments: Harmonized Tariff Schedule subheading; description; U.S. col. 1 rates of duty as of Jan. 1, 1996; U.S. exports, 1995; and U.S. imports, 1995

HTS subheading	Description	Col. 1 rate of duty as of Jan. 1, 1996		U.S. exports, 1995	U.S. imports, 1995
		General	Special[1]		
3204.17.04	Selected pigments and preparations based thereon	7.6%	Free (CA,E,IL, J) 5.8% (MX)	(2)	57
3204.17.08	Pigment red 178; pigment yellow 101, 138	Free		(2)	7
3204.17.20[3]	Copper phthalocyanine, not ready for use as pigment	15.3%	Free (CA,E,IL,J) 12.2% (MX)	(2)	35
3204.17.40	Selected pigments and preparations based thereon	Free		(2)	22
3204.17.60	Pigments listed in the Chemical Appendix to the Tariff Schedules of the United States	13.3%	Free (CA,E,IL,J) 10.5% (MX)	(3)	69
3204.17.90	Pigments not listed in the Chemical Appendix to the Tariff Schedules of the United States	17.3%	Free (CA,E,IL,J) 14% (MX)	(2)	142
3205.00.05[3]	Food coloring solutions containing carmine, but no synthetic coloring	Free		(2)	2
3205.00.15[3]	Other natural coloring material	13.3%	Free (CA, E, IL, J) 11% (MX)	(2)	2
3205.00.40	Lakes not listed in the Chemical Appendix to the Tariff Schedules of the United States	13.3%	Free (CA,E,IL,J) 10.5% (MX)	(2)	5
3205.00.50	Lakes listed in the Chemical Appendix to the Tariff Schedules of the United States	17.3%	Free (CA,E,IL,J) 14% (MX)	(2)	(4)

[1] Programs under which special tariff treatment may be provided, and the corresponding symbols for such programs as they are indicated in the "Special" subcolumn, are as follows: Generalized System of Preferences (A); Automotive Products Trade Act (B); Agreement on Trade in Civil Aircraft (C); goods of Canada under the NAFTA (CA); Caribbean Basin Economic Recovery Act (E); Andean Trade Preference Act (J); and United States-Israel Free Trade Area (IL); and goods of Mexico under the NAFTA (MX).

[2] Data on U.S. exports of synthetic organic pigments (totaling $283 million in 1995) are not available at the 8-digit HTS level.

[3] HTS Nos. 3204.17.20, 3205.00.05, and 3205.00.15 are not defined as synthetic organic pigments in this summary and excluded from the import and export tables.

[4] Less than $500,000.

Source: HTS; U.S. exports and imports compiled from official statistics of the U.S. Department of Commerce.

Listed in the "Intermediate Chemicals For Dyes" Appendix to the 1997 HTS are a number of chemical intermediates used to manufacture dyes that are eligible for duty-free treatment under the provisions of general note 14 of the HTS. Some of these chemicals are also used in the manufacture of pigments. This list is primarily of products that were eligible for temporary duty suspensions during the 104th Congress.

Nontariff measures

Neither industry sources nor the 1996 National Trade Estimates report, published by the Office of the United States Trade Representative, identified any major nontariff measures affecting trade in pigments. Few classification criteria adjustments or substantive changes have affected organic pigments as a result of the 1989 conversion from the Tariff Schedules of the United States (TSUS) to the HTS. However, one product, copper phthalocyanine, was transferred from TSUS 406.44.00 (a listing for organic chemical intermediates) to HTS subheading 3204.17.20 (a listing for pigments).

U.S. Exports

Principal Markets and Export Levels

For organic pigments, Western Europe, North America, and Eastern Asia are the largest consuming geographic regions, and the United States, Japan, Germany, and France are the four largest individual consuming countries. The republics of the former Soviet Union and the countries in Eastern and Central Europe were relatively small markets for U.S. pigment exports during 1991-95. Although analysts expect that the recent political changes will increase future sales to this area, they note that many of these countries not only have pigments technology, but they also have been producing the older products for years. Furthermore, with less restrictive environmental regulations, these countries are more likely to produce and consume older generic products.

In general, the synthetic organic pigments markets in developing countries are relatively small, primarily due to their small domestic markets for locally produced coatings, inks, and plastics. In the 1990s, their future has been the subject of some debate. One analyst stated that, in general, "small countries, although good investment possibilities, won't play an important role in the future pigments industry, which is stable and growing at the rate of 2.5 percent annually. Pigment consumption is related to the gross national product of the highly industrialized world."[64] However, another analyst stated that future markets may be found in countries of the former Soviet Union: "As the doors of Russia and Eastern Europe open, for example, there will be a tremendous explosion of color — people there will want more color in their lives, as they perceive themselves free and happy."[65]

The most significant export products for U.S. producers were reported to be mid-value ink pigments, in terms of volume, and higher performance ink and coatings pigments, in terms of value. A large portion of U.S. exports to Europe were believed to be sales by large European-owned multinational companies with production facilities in the United States. In 1994, at least seven of the estimated 31 U.S. synthetic organic pigment producers, including the top five multinational producers, exported their products.[66] The multinational producers distributed products through their foreign affiliates, while the smaller companies used international marketing agencies. Most U.S. synthetic organic pigments producers consider exports an important offset to any increase in U.S. imports.

During 1991-95, total U.S. organic pigment exports increased 50 percent from $200 million in 1991 to $299 million in 1994, with a slight decline in 1995 (table 9). Within the group of total exports, exports of commodity pigments increased by some 17 percent, mostly to non-European markets, while exports of high- and mid-performance organic pigments increased by 16 percent, mostly to European countries. In terms of quantity, total U.S. exports increased by 61 percent over the period. U.S. exports to Canada increased 70 percent from $32 million to $54 million. Reportedly, European countries are expensive producers in selected products (U.S. import unit values, table 6).[67] In response, Canadian purchasers are purchasing more pigments from the United States. A similar situation has reportedly occurred with independent European users, who have increased purchases from the United States. The export data indicate that Belgium and, to a lesser extent, the Netherlands are growing EU markets. However, the export data for the Netherlands likely reflect transshipments, as Rotterdam and Antwerp are major chemical ports through which organic pigments are transported throughout the EU.

U.S. exports to its three largest trading partners, Canada, Belgium, and the United Kingdom, increased steadily between 1991 and 1995 (table 9). U.S. exports to Japan, the fourth largest, were cyclical, but trended upwards. However, U.S. exports to Germany, the fifth

[64] Appendix A includes an explanation of tariff and trade agreement terms.

[65] Compiled from official statistics of the U.S. Department of Commerce.

[66] Information obtained during field interviews in March 1994.

[67] The issues discussed in this paragraph were based on information obtained during field interviews in March 1994.

Table 9
Synthetic organic pigments: U.S. exports for principal markets, 1991-95

Source	1991	1992	1993	1994	1995
	Quantity *(1,000 kilograms)*				
Canada	3,786	4,742	5,631	6,963	6,821
Belgium	3,009	4,037	7,899	8,536	9,669
United Kingdom	5,067	5,097	5,322	7,979	6,308
Japan	1,144	1,026	1,268	1,501	1,427
Germany	2,176	1,372	1,004	1,032	797
Brazil	252	386	440	427	780
Mexico	921	1,520	1,477	1,709	1,539
Netherlands	318	385	438	465	436
South Korea	171	156	257	273	257
France	396	262	461	462	216
All other	4,535	5,726	5,625	5,689	6,723
Total Exports	21,776	24,710	29,822	35,036	34,974
	Value *(1,000 dollars)*				
Canada	31,590	39,732	48,569	53,102	53,656
Belgium	32,987	36,531	56,998	65,708	48,268
United Kingdom	16,719	19,241	23,201	29,898	30,315
Japan	18,341	15,133	16,910	17,880	21,094
Germany	21,961	19,075	15,347	18,696	18,013
Brazil	3,785	4,910	6,369	9,289	17,023
Mexico	9,151	13,297	13,990	14,780	16,530
Netherlands	8,534	8,037	10,560	10,335	13,496
South Korea	3,082	3,828	5,539	5,570	6,389
France	4,640	5,307	6,430	8,660	5,781
All other	48,904	58,178	63,185	65,556	52,500
Total Exports	199,694	223,270	267,097	299,474	283,067
	Unit value *(dollars per kilogram)*				
Canada	8.34	8.38	8.63	7.63	7.87
Belgium	10.96	9.05	7.22	7.70	4.99
United Kingdom	3.30	3.78	4.36	3.75	4.81
Japan	16.04	14.75	13.34	11.92	14.79
Germany	10.09	13.90	15.28	18.12	22.59
Brazil	15.00	12.72	14.46	21.74	21.81
Mexico	9.94	8.75	9.47	8.65	10.74
Netherlands	26.80	20.87	24.12	22.23	30.94
South Korea	18.00	24.53	21.51	20.43	24.88
France	11.71	20.23	13.96	18.74	24.82
All other	10.78	10.16	11.23	11.52	7.81
Total Exports	9.17	9.04	8.96	8.55	8.09

Source: Compiled from official statistics of the U.S. Department of Commerce.

largest, declined by 18 percent in terms of value and 63 percent in terms of quantity. Exports to countries of the EU as a whole were basically steady. In the last five years, Brazil has become a significant developing country market for U.S. pigments, increasing its purchases from $3.8 million in 1991 to $17 million in 1995. During the period, U.S. exports were reportedly influenced by business conditions in these countries.

Foreign Trade Measures

The primary export markets for U.S. synthetic organic pigments are Canada, Japan, and the EU. Under the U.S.-Canada Free Trade Agreement, which entered into force on January 1, 1989, Canada agreed to eliminate its duties on all imports of qualifying U.S.-origin products over a 10-year period. The Canadian Tariff Schedule of duty reductions was incorporated into NAFTA, which entered into force on January 1, 1994. The 1995 Canadian MFN tariff rates for non-NAFTA products ranged from free to 12.5 percent ad valorem. Canada has two other special rates: the British Preferential Tariff (BPT), which applies to developing countries that are members of the British Commonwealth; and the Least Developed Developing Country rates, which apply to countries identified as such by the United Nations.[68]

[68] U.S. Department of Commerce country desk staff and headnotes to the Canadian Tariff Schedule.

Organic pigments entering Japan are subject to four possible rates—the General, the GATT, Preferential, and Temporary rates.[69] General rates for these products range from free to 20 percent ad valorem, with a large number of the rates at 15 percent. Duties on imports entering under the GATT range from free to 5.8 percent ad valorem, the most applicable ranging from 4.6 to 5.6 percent. Products enter duty free under the Preferential rates, whereas Temporary rates are slightly less than or equal to the GATT rate.

All EU imports are subject to one of two duty rates—Conventional or Autonomous.[70] 1995 EU imports of synthetic organic pigments from the United States and most other developed countries are subject to rates ranging from 5.5 percent to 14 percent ad valorem under the Conventional rate.

In addition, a large number of unilateral trade preferences to developing countries are presented as duty-free imports, with limitations to these preferences defined by quotas. If a developing country exceeds its quota, a member country may object, and any continued importation is subject to the Conventional rate. If no country objects, the developing country can continue to export to the EU duty free. There are currently no European trade relief actions affecting U.S. pigment exports to Europe.

FOREIGN INDUSTRY PROFILE

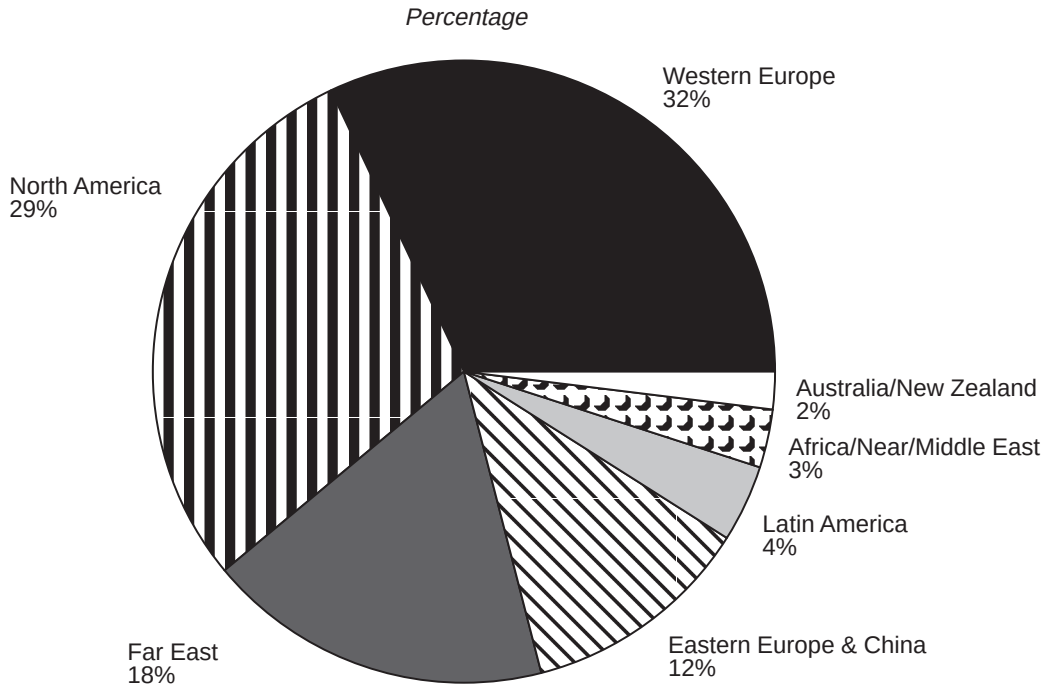
The world's three major producing areas of synthetic organic pigments—Europe, North America, and Japan—are also the major consuming areas (when ranked by sales). In addition, they are large producers and consumers of the inks, paints, and plastics in which synthetic organic pigments are used. The 1991 regional consumption of organic pigments is shown in figure 9.[71]

[69] Department of Commerce Japan country desk staff and relevant portions of the headnotes to the *Customs Tariff Schedules of Japan,* 1995.

[70] U.S. Department of Commerce, European Union desk staff and relevant portions of the EC Journal.

[71] Industry analysts report that these percentages have remained basically constant in recent years.

Figure 9
Synthetic organic pigments: Average world regional consumption, by value, 1991



Source: *American Ink Maker*, Nov. 1992, p. 40.

Three of the five largest pigment producers in the world are headquartered in Germany and Switzerland, while two are headquartered in Japan.[72] These five producers reportedly account for over 50 percent of world production. In general, Japanese companies sell principally in the Far East, while U.S. and European companies sell their products worldwide. All five major foreign multinational companies maintain production facilities in the United States. Industry officials state that European firms have traditionally excelled at developing high-performance pigments, whereas the Japanese firms have succeeded in optimizing pigments for specific applications.[73]

As is the case of U.S. firms operating in the United States, European and Japanese producers must contend in their home markets with (1) strict environmental and health regulations, (2) uncertain supplies of chemical intermediates, and (3) low-priced imported pigments from developing countries such as India and China. For members of the European Union, environmental measures are generally in the form of EU directives, and member states must promulgate legislation and regulations to implement these directives.

As in the United States, having a stable supply of chemical intermediates (with relatively stable prices) has been an important issue for foreign organic pigments industries. During the 1980s, worldwide chemical intermediates prices increased reportedly due to the pre-1986 price increases of crude petroleum and increased environmental regulation. Consequently, many smaller independent European and Japanese pigments manufacturers, which had previously manufactured their own intermediates, found it no longer economical to continue this practice. To remain price-competitive in world markets, these pigments producers began to purchase pigment intermediates from large-scale domestic producers or import from foreign suppliers.[74]

Some large multinational pigment manufacturers, such as BASF, are integrated backwards into producing various types of pigment intermediates. These producers are likely to hold a competitive advantage over other producers in terms of economies of scale and scope, and in terms of availability and cost of raw materials. One analyst noted that:

> Companies whose large size allows them to weather the cycles of the pigment market continue to do business even at reduced profitability.... Others have a vertical structure and make their own intermediates, thus shielding themselves somewhat from the vagaries of the market, letting other parts of their business supplement the pigments arena.[75]

Most of these integrated producers operated production facilities in Europe, the United States, or Japan. Despite the use of larger cost-effective production facilities and increased productivity, the cost of pigment intermediates continued to increase during the 1980s and 1990s, and some analysts reported supply shortages for a number of intermediates.

On the other hand, certain developing countries have acquired technical capacity, which when combined with significantly lower operating costs makes them potentially important world sources of pigments and intermediates. The president of one European chemical company stated:

> There are two areas in the world where the operating costs—especially labor costs, energy costs, environmental cost—are much lower compared to Germany or Western Europe: the Far East and Eastern Europe. For commodity and basic chemicals, we are forced to transfer the present activities in western Germany ... to countries in Eastern Europe [and the Far East]. Because otherwise you will lose the market...basic chemicals for dyes and pigments are produced so cheaply in Eastern Europe that they are below 50% of our present operating costs.[76]

And for some intermediates, the representative further noted:

> We have closed some organic intermediates for dyes [and pigment] production because we couldn't compete with products from Hungary

[72] Because of changing exchange rates, it was not practicable to compare individual company world market shares during 1991-95.

[73] Information obtained in field interviews conducted in March 1994.

[74] Information obtained from field interviews conducted in March 1994.

[75] "Are Pigments Profitable?", *American Ink Maker*, June 1991, p. 13.

[76] "Bayer's Schneider on the Competitiveness Imperative," *Chemical Week*, Apr. 13, 1994, p. 34.

> or India or other countries. We don't transfer these activities. It's cheaper to buy the products, and by transferring these facilities, you [anyway] don't solve your problems at home.[77]

However, many industry analysts note that, as of yet, the supply of low-cost intermediates from developing countries is insufficient to meet the world's needs. Therefore, for the foreseeable future, pigment industries throughout the industrialized world seeking chemical intermediates will likely be subject to intermittent supply shortages and fluctuating prices.

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[77] Ibid.

APPENDIX A
EXPLANATION OF TARIFF AND TRADE AGREEMENT TERMS

APPENDIX A
TARIFF AND TRADE AGREEMENT TERMS

In the ***Harmonized Tariff Schedule of the United States*** (HTS), chapters 1 through 97 cover all goods in trade and incorporate in the tariff nomenclature the internationally adopted Harmonized Commodity Description and Coding System through the 6-digit level of product description. Subordinate 8-digit product subdivisions, either enacted by Congress or proclaimed by the President, allow more narrowly applicable duty rates; 10-digit administrative statistical reporting numbers provide data of national interest. Chapters 98 and 99 contain special U.S. classifications and temporary rate provisions, respectively. The HTS replaced the *Tariff Schedules of the United States* (TSUS) effective January 1, 1989.

Duty rates in the ***general*** subcolumn of HTS column 1 are most-favored-nation (MFN) rates, many of which have been eliminated or are being reduced as concessions resulting from the Uruguay Round of Multilateral Trade Negotiations. Column 1-general duty rates apply to all countries except those enumerated in HTS general note 3(b) (Afghanistan, Cuba, Laos, North Korea, and Vietnam), which are subject to the statutory rates set forth in ***column 2.*** Specified goods from designated MFN-eligible countries may be eligible for reduced rates of duty or for duty-free entry under one or more preferential tariff programs. Such tariff treatment is set forth in the ***special*** subcolumn of HTS rate of duty column 1 or in the general notes. If eligibility for special tariff rates is not claimed or established, goods are dutiable at column 1-general rates. The HTS does not enumerate those countries as to which a total or partial embargo has been declared.

The ***Generalized System of Preferences*** (GSP) affords nonreciprocal tariff preferences to developing countries to aid their economic development and to diversify and expand their production and exports. The U.S. GSP, enacted in title V of the Trade Act of 1974 for 10 years and extended several times thereafter, applied to merchandise imported on or after January 1, 1976 and before the close of May 31, 1997. Indicated by the symbol "A" or "A*" in the special subcolumn, the GSP provided duty-free entry to eligible articles the product of and imported directly from designated beneficiary developing countries, as set forth in general note 4 to the HTS.

The ***Caribbean Basin Economic Recovery Act*** (CBERA) affords nonreciprocal tariff preferences to developing countries in the Caribbean Basin area to aid their economic development and to diversify and expand their production and exports. The CBERA, enacted in title II of Public Law 98-67, implemented by Presidential Proclamation 5133 of November 30, 1983, and amended by the Customs and Trade Act of 1990, applies to merchandise entered, or withdrawn from warehouse for consumption, on or after January 1, 1984. Indicated by the symbol "E" or "E*" in the special subcolumn, the CBERA provides duty-free entry to eligible articles, and reduced-duty treatment to certain other articles, which are the product of and imported directly from designated countries, as set forth in general note 7 to the HTS.

Free rates of duty in the special subcolumn followed by the symbol "IL" are applicable to products of Israel under the ***United States-Israel Free Trade Area Implementation Act*** of 1985 (IFTA), as provided in general note 8 to the HTS.

Preferential nonreciprocal duty-free or reduced-duty treatment in the special subcolumn followed by the symbol "J" or "J*" in parentheses is afforded to eligible articles the product of designated beneficiary countries under the ***Andean Trade Preference Act*** (ATPA), enacted as title II of Public Law 102-182 and implemented by Presidential Proclamation 6455 of July 2, 1992 (effective July 22, 1992), as set forth in general note 11 to the HTS.

Preferential or free rates of duty in the special subcolumn followed by the symbol "CA" are applicable to eligible goods of Canada, and rates followed by the symbol "MX" are applicable to eligible goods of Mexico, under the ***North American Free Trade Agreement***, as provided in general note 12 to the HTS and implemented effective January 1, 1994 by Presidential Proclamation 6641 of December 15, 1993. Goods must originate in the NAFTA region under rules set forth in general note 12(t) and meet other requirements of the note and applicable regulations.

Other special tariff treatment applies to particular **products of insular possessions** (general note

3(a)(iv)), products of the West Bank and Gaza Strip (general note 3(a)(v), goods covered by the ***Automotive Products Trade Act*** (APTA) (general note 5) and the ***Agreement on Trade in Civil Aircraft*** (ATCA) (general note 6), ***articles imported from freely associated states*** (general note 10), ***pharmaceutical products*** (general note 13), and ***intermediate chemicals for dyes*** (general note 14).

The ***General Agreement on Tariffs and Trade 1994*** (GATT 1994), annexed to the Agreement Establishing the World Trade Organization, replaces an earlier agreement (the GATT 1947 [61 Stat. (pt. 5) A58; 8 UST (pt. 2) 1786]) as the primary multilateral system of disciplines and principles governing international trade. Signatories' obligations under both the 1994 and 1947 agreements focus upon most-favored- nation treatment, the maintenance of scheduled concession rates of duty, and national (nondiscriminatory) treatment for imported products; the GATT also provides the legal framework for customs valuation standards, "escape clause" (emergency) actions, antidumping and countervailing duties, dispute settlement, and other measures. The results of the Uruguay Round of multilateral tariff negotiations are set forth by way of separate schedules of concessions for each participating contracting party, with the U.S. schedule designated as Schedule XX.

Pursuant to the ***Agreement on Textiles and Clothing*** (ATC) of the GATT 1994, member countries are phasing out restrictions on imports under the prior "Arrangement Regarding International Trade in Textiles" (known as the ***Multifiber Arrangement*** (MFA)). Under the MFA, which was a departure from GATT 1947 provisions, importing and exporting countries negotiated bilateral agreements limiting textile and apparel shipments, and importing countries could take unilateral action in the absence or violation of an agreement. Quantitative limits had been established on imported textiles and apparel of cotton, other vegetable fibers, wool, man-made fibers or silk blends in an effort to prevent or limit market disruption in the importing countries. The ATC establishes notification and safeguard procedures, along with other rules concerning the customs treatment of textile and apparel shipments, and calls for the eventual complete integration of this sector into the GATT 1994 over a ten-year period, or by Jan. 1, 2005.